REMARKS

Applicants wish to thank the Examiner for withdrawing Tanaka et al, Lee et al, Nishiyama et al, Mukoh et al and Kumar et al as references.

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The present invention as set forth in **Claim 1** relates to a **chiral nematic liquid crystal optical element**, comprising:

a pair of substrates with transparent electrodes; and

a liquid crystal layer having a memory property interposed between the substrates;

a first resin layer which is provided on one of the transparent electrodes,

said first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer;

a non-alignment layer of a second resin layer, a vertical alignment layer of a second resin layer or a horizontal alignment layer of a second resin layer which is provided between the liquid crystal layer and the other of the transparent electrodes;

wherein said liquid crystal layer exhibits a planar state and a focal conic state.

Claims 2-4 and 11-18 depend on Claim 1.

Claim 27 relates to the liquid crystal optical element according to Claim 1, wherein said rubbed vertical alignment surface does not twist the liquid crystal at 240°.

The rubbed vertical alignment surface of the first alignment layer is discussed at page 23, line 22 to page 24, line 22:

> "In accordance with the present invention, the alignment layer of at least one of the substrates is a vertical alignment layer subjected to rubbing (hereinbelow, also referred to as RVA: Rubbed Vertical Alignment).
>
> **As a result, some of helical axes of the domains in a region of the liquid crystal in contact with the RVA are aligned by surface interaction, for example anchoring strength.** Thus, coupling occurs between planar domains. There is a clear tendency for planar domains to be formed at a greater size than normal. As a result, the liquid crystal layer exhibits

reflection characteristics as if the liquid crystal layer is a mirror. Thus, it becomes possible to perform display with light having high brightness.

On the other hand, when an interface obtainable by subjecting a horizontal alignment layer to a rubbing treatment is provided on one of the inner planes of the liquid crystal cell, the following situations are provided. When the liquid crystal layer is in PL, the liquid crystal layer performs display in high brightness as in the case stated earlier. When the liquid crystal layer is in FC, the alignment tends to partly returns to planar alignment. In the latter case, selective reflection by PL overlaps with scatter by FC. As a result, the contrast ratio reduces to about 50-60% in comparison with the contrast ratio in normal display with two states of PL and FC utilized therein."

(PL-planar, FC-focal conic)

In the present invention, even if an alignment layer is employed, which has been subjected to rubbing and has vertical alignment property, the chiral nematic liquid crystal exhibits bistability, i.e. a focal conic and a planar state. As a result a display exhibiting high brightness is obtained.

None of the cited references disclose or suggest, alone or in combination, a first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer; and a second resin layer which is a non-alignment layer, a vertical alignment layer or a horizontal alignment layer.

West et al disclose multistable chiral nematic displays. However, the displays use either no alignment layer (West et al, Example 1) or unrubbed polyimide (West et al, col. 7, line 4, Example 2) or other materials (West et al, col. 7, lines 1-10). However, there is no disclosure or suggestion of a material having **vertical alignment** capability. The disclosed polyimide is usually used for horizontal direction alignment.

In addition, the reference discloses that best results have been obtained using rubbed ITO without any additional surface treatments (West et al, col. 7, lines 9 and 10). Thus, this reference teaches away from using a resin layer having a rubbed vertical alignment surface as claimed in Claim 1.

The Examiner has taken the position that Examples 16-20, 22, 23 and 32-37 represent chiral nematic liquid crystal optical elements having the claimed alignment, which requires that there is one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer. Applicants disagree. West et al merely disclose that the resin layers on **opposite substrates are rubbed in parallel or perpendicular with respect to each other**. For example, col. 9, lines 6-10 of West et al disclose: "In examples 17 and 18, the PVF coatings on opposite substrates were rubbed parallel and perpendicular to each other, respectively. Similarly, the coatings on opposite substrates in examples 22 and 23 were rubbed parallel and perpendicular to each other, respectively." However, there is no disclosure regarding the claimed alignment: one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer.

JP 08-220326 fails to cure the defects of West et al because there is **no vertical alignment layer as claimed**. In fact, there is no resin layer in contact with a liquid crystal layer as required by the claims of the present invention. Applicants have previously filed a **Certified English Translation of the front page of** JP 08-220326. All that **JP 08-220326 discloses** is **a color filter and not a liquid crystal display**. The color filter may be applied to a liquid crystal display. However, West et al is designed for a scattering state and a light reflecting state of green, red, blue or any pre-selected color depending on the pitch length of the chiral nematic LC. Thus, inherently, **West et al do not require a color filter**. Therefore, the combination with JP 08-220326 is improper. However, even if combined with West et al, the claimed invention cannot result. The proposed device based on a combination of West et al and JP 08-220326 does not have the claimed alignment: one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer.

Khan et al disclose a liquid crystal device having a chiral nematic liquid crystal (Khan et al, abstract). The Examiner has cited the reference to show insulating layers as in Claim 20. However, Khan et al do not cure the defects of West et al and JP 08-220326 because there is no alignment as claimed: one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer. Thus, even a combination of West et al, JP 08-220326 and Khan et al does not result in the claimed invention.

Therefore, the rejection of Claims 1, 2, 4, 11-13 and 18 under 35 U.S.C. 102(b) over West et al, the rejection of Claims 3, 4, 14, 16 and 17 under 35 U.S.C. 103 (a) over West et al in view of JP 08-220326, the rejection of Claim 15 under 35 U.S.C. 103 (a) over West et al in view of JP 08-220326 and further in view of Khan et al, are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

Further, the present invention as set forth in **amended Claim 5** relates to a **chiral nematic liquid crystal optical element**, comprising:

a pair of substrates with transparent electrodes; and

a liquid crystal layer having a memory property interposed between the substrates;

a metal-oxide layer provided on at least one of the transparent electrodes;

a first resin layer which is provided on one of the transparent electrodes,

said first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer;

a non-alignment layer of a second resin layer, a vertical alignment layer of a second resin layer or a horizontal alignment layer of a second resin layer which is provided between the liquid crystal layer and the other of the transparent electrodes;

wherein said liquid crystal layer exhibits a planar state and a focal conic state.

Claims 6-8 and 19-23 depend on Claim 5.

Claim 28 relates to the liquid crystal optical element according to Claim 1, wherein said rubbed vertical alignment surface does not twist the liquid crystal at 240°.

None of the cited references disclose or suggest, alone or in combination, a first resin layer having a rubbed vertical alignment surface in contact with the liquid crystal layer; and a second resin layer which is a non-alignment layer, a vertical alignment layer or a horizontal alignment layer.

As discussed above, West et al provide no disclosure or suggestion of the claimed alignment, which requires that there is one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer. In addition, as acknowledged by the Examiner, West et al fail to disclose or suggest a metal oxide layer provided on at least one of the transparent electrodes (Office Action of December 28, 2004, page 5, line 5 and 4 from the bottom).

However, the combination with Konuma et al does not result in a chiral nematic liquid crystal optical element as claimed because the proposed combination lacks one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer.

Gotoh et al has been cited to show a driving voltage as in Claim 6. However, the combination of West et al, Konuma et al and Gotoh et al does not result in the claimed invention because the proposed combination lacks one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer.

JP 08-220326 fails to disclose or suggest a resin layer having a rubbed vertical alignment surface. In fact, all that this reference discloses is a color filter. West et al do not require a color filter. Therefore, the combination with JP 08-220326 is improper.

Khan et al disclose a liquid crystal device having a chiral nematic liquid crystal (Khan et al, abstract). The Examiner has cited the reference to show insulating layers as in Claim 20. However, Khan et al do not cure the defects of West et al, Konuma et al and JP 08-220326 because there is no alignment as claimed: one rubbed vertical alignment layer combined with a non-alignment layer, a vertical alignment layer or a horizontal alignment layer. Thus, even a combination of West et al, JP 08-220326, Konuma et al and Khan et al does not result in the claimed invention.

Therefore, the rejection of Claims 5 and 23 under 35 U.S.C. § 103(a) over West et al in view of Konuma et al, the rejection of Claim 6 under 35 U.S.C. § 103(a) over West et al in view of Konuma et al and further in view of Gotoh et al, the rejection of Claims 7, 19, 21 and 22 under 35 U.S.C. 103 (a) over West et al in view of Konuma et al and further in view of JP 08-220326, the rejection of Claim 8 under 35 U.S.C. 103 (a) over West et al in view of Konuma et al and further in view of Gotoh et al and further in view of JP 08-220326, the rejection of Claim 20 under 35 U.S.C. 103 (a) over West et al in view of Konuma et al and further in view of JP 08-220326 and further in view of Khan et al are believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

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